Rayat Shikshan Sanstha's Yashavantrao Chavan Institute of Science, Satara Syllabus for Certificate Course (UG)

1. TITLE: **Advanced Diploma in Embedded System design**
2. YEAR OF IMPLEMENTATION: 2018
3. PREAMBLE:

Advanced Diploma in Embedded System Design is an integrated course in faculty of Electronics. This is a humble endeavor to initiate the process towards an era of knowledge. The students from Electronics field should also be competent for this change in the technology.

In this year, a student will able to understand handling of laboratory equipments, design embedded systems with confidence. In the subject, the student will also get a circuit designing and proper knowledge in the field of Embedded System design

4. GENERAL OBJECTIVES OF THE COURSE:
    1. To educate the students for designing a developing of PCB
    2. To make familiar students about 8 bit microcontroller, Embedded C programming and open source hardware platforms.
    3. To develop embedded C programming attitude for 8 bit microcontroller and Arduino
    4. To familiar sensors and actuators for embedded system design
    5. To familiar interfacing of different peripherals with 8 bit microcontroller.
    6. To develop embedded systems using 8 bit microcontroller and Arduino
5. DURATION: Three Year
6. PATTERN: Annual
7. MEDIUM OF INSTRUCTION: English
8. STRUCTURE OF COURSE:

Year	Paper No and Name	Contact hours	Credits	Marks
1	CET101: **Introduction to EDA tools**	48	4	100
	CEL102: **Introduction to EDA tools Lab**	96	4	100
	CEP103: **Project Work**	24	2	50
	Total	**168**	**10**	**250**
2	DET201: **C Programming and Basics of Embedded System Design**	48	4	100
	DEL202: **C Programming and Basics of Embedded System Design Lab**	96	4	100
	DEP203: **Project Work**	24	2	50
	Total	**168**	**10**	**250**
3	ADET301: **Embedded System Design**	48	4	100

	ADEL302: **Embedded System Design Lab**	96	4	100
	ADEP303: **Project Work**	24	2	50
	Total	**168**	**10**	**250**
Total		**504**	**30**	**750**

C: Certificate Course, D: Diploma, AD: Advance Diploma, T: Theory, L: Lab work, P: Project work

9. OTHER FEATURES:

A. <u>LIBRARY:</u>

- **REFERENCE BOOKS**

1. Essential Electronic Design Automation (EDA), Birnbaum2004, Birnbaum, Mark D., Prentice Hall Modern Semiconductor Design, 2004
2. Introduction To PSpice Using OrCAD For Circuits And Electronics, 3rd Edition 3rd Edition (English, Paperback, Muhammad H. Rashid)
3. Printed circuit Board – Design & Technology by Walter C. Bosshart, TMH.
4. Printed Circuit Board –Design, Fabrication, Assembly & Testing, R.S. Khandpur, TMH
5. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, PHI
6. Electronics text lab manual, Paul B. Zbar.
7. Basic Electronics & Linear circuits, N.N. Bhargava, D.C. Kulshresta & D.C Gupta-TMH.
8. Electronic devices, David A Bell, Reston Publishing Company/DB Tarapurwala Publ.
9. Walter C.Bosshart "PCB DESIGN AND TECHNOLOGY" TMH
10. Clyde F.Coombs "Printed circuits Handbook" III Edition, McGraw Hill
11. Yashavant Kanetkar, Let Us C , BPB Publications
12. Programming in ANSI C, Balagurusamy, 2nd edition, TMH
13. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, Prentice Hall
14. Kenneth J Ayala, The 8051 Microcontroller & Embedded Systems Using Assembly and C (With CD) 1st Edition, Delmar Cengage Learning (2010).
15. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, The 8051
16. Microcontroller and Embedded Systems Using Assembly and C, Pearson (2007)
17. Kenneth J Ayala, The 8051 Microcontroller & Embedded Systems Using Assembly and C (With CD) 1st Edition, Delmar Cengage Learning (2010).
18. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, The 8051
19. Microcontroller and Embedded Systems Using Assembly and C, Pearson (2007)
20. Michel Margolis, Arduino Cookbook, 2nd Edition
21. Massimo Banzi, Getting Started with Arduino
22. John Boxall, Arduino Workshop: A Hands-On Introduction with 65 Projects

- **JOURNALS AND PERIODICALS**

1. Journal of Instrument Society of India
2. Express Computer
3. Embedded For You
4. Electronics Maker
5. Electronics For You
6. PCQUEST
7. Digit

B. SPECIFIC EQUIPMENTS:

Computers, Laptops, Printers, Scanners, LCD Projectors, E- Podium, Smart Board, Document Camera, Visualizer

C. LABORATORY EQUIPMENTS:

1. Digital storage Oscilloscope: 60 MHz
2. Signal generator
3. Microwave Test bench (Gunn Source)
4. Antenna Trainer
5. Arduino Development Board
6. CPLD development boards
7. Microcontroller Boards – 8051, MSP430, PIC18F, AVR MEGA32, ARDUINO NANO, UNO, MEGA
8. KEIL - IDE
9. Mikro C Compilers for 8051, PIC and ARM
10. Soft Computing Tools – SCILAB, MATLAB
11. PCB Designing Tool: DipTrace

Diploma in Embedded System Design

DET201: C Programming and Basics of Embedded System Design

- **Learning Objectives:**
  1. To educate the fundamentals of C programming to students
  2. To develop designing and analysing attitude about computation mathematics
  3. To study control structure, array and pointer concepts in C
  4. To educate the architecture of 8 bit microcontroller and Embedded C programming Platforms
  5. To develop embedded C programming attitude for 8 bit microcontroller

Unit I: Fundamentals of C Programming **10L**

C Programming Language: Introduction, Importance of C, Character set, Tokens, keywords, identifier, constants, basic data types, variables: declaration & assigning values. Structure of C program Arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bit wise operators, expressions and evaluation of expressions, type cast operator, implicit conversions, precedence of operators.

Unit II: Control Structure, Array and Pointer **12L**

Decision making, branching and looping: if, if-else, else-if, switch statement, break, for loop, while loop and do loop.

Functions: Defining functions arguments and passing, returning values from functions.

Arrays-concepts, declaration, accessing elements, storing elements, two-dimensional and multi-dimensional arrays, Input output statement and library functions (math and string related functions).

Pointer Concepts, declaration of pointer, Types of pointers, pointer arithmetic

Unit III: Introduction to MCS 51 Family **12L**

First Embedded Application**,** Different Microcontroller Architecture**,** Different kinds of Microcontroller, Difference between Processors and Controllers, **Scope of Embedded System and further Advancements:** Applications**,** Market research, Growth Rate,

Introduction to Microcontroller, Classification of Microcontrollers- 4-bit, 8-bit, 16-bit, 32-bit, Package Structure, Market Scenario on the basis of types of Controllers

Introduction to 8051, Basic Architecture Description of 8051 Pin Diagram, Memory Organization, SFRs description, Addressing Modes, Instruction Set Introduction

Unit IV: 8051 Architecture **14L**

Introduction to General Microcontroller Terms- Program Counter, Accumulator**,** Reset**,** Clock Cycle, Machine Cycle, Instruction Cycle, Interrupts**,** SFRs & GPRs**,** Stack, Stack Pointer, Stack Operation**,** General Purpose Input-Output PORTs, Interrupt, Timers

- **Learning Outcomes:**

Students should demonstrate their ability to:

1) To elaborate the fundamentals of C programming concets
2) Analyse and Solve computation mathematics problems
3) Elaborate control structure, array and pointer concepts in C
4) Learn the architecture of 8 bit microcontroller and Embedded C programming Platforms
5) Develop embedded C programs with 8 bit microcontroller for Embedded System Design

- **Recommended Books:**

1. Yashavant Kanetkar, Let Us C , BPB Publications
2. Programming in ANSI C, Balagurusamy, 2nd edition, TMH
3. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, Prentice Hall
4. Kenneth J Ayala, The 8051 Microcontroller & Embedded Systems Using Assembly and C (With CD) 1st Edition, Delmar Cengage Learning (2010).
5. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, The 8051
6. Microcontroller and Embedded Systems Using Assembly and C, Pearson (2007)

DEL202: C Programming and Basics of Embedded System Design Lab (Hardware and Circuit Simulation Software)

- **Learning Objectives:**
  1. To educate the fundamentals of C programming to students
  2. To develop designing and analysing attitude about computation mathematics
  3. To study control structure, array and pointer concepts in C
  4. To educate the architecture of 8 bit microcontroller and Embedded C programming Platforms
  5. To develop embedded C programming attitude for 8 bit microcontroller

GROUP A

1. Generate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. Find minimum and maximum of N numbers.
3. Find the GCD of two integer numbers.
4. Calculate factorial of a given number.
5. Find all the roots of a quadratic equation Ax2 + Bx + C = 0 for non – zero coefficients A, B and C. Else report error.
6. Calculate the value of sin (x) and cos (x) using the series. Also print sin (x) and cos (x) value using library function.
7. Generate and print prime numbers up to an integer N.
8. Sort given N numbers in ascending order.
9. Find the sum & difference of two matrices of order MxN and PxQ.
10. Find the product of two matrices of order MxN and PxQ.
11. Find the transpose of given MxN matrix.
12. Find the sum of principle and secondary diagonal elements of the given MxN matrix.

GROUP B

1. Study of simulator
2. Study of Addressing Mode
3. Study of Arithmetical Operation
4. Study of Logical Operation
5. Interfacing switch with 8051 microcontroller
6. Interfacing of LED with 8051 microcontroller
7. Interfacing of Relay with 8051 microcontroller
8. Interfacing of Seven Segment with 8051 microcontroller.
9. Interfacing of Thoumbwheel Switch with 8051 microcontroller.
10. Interfacing of LCD with 8051 microcontroller.

- **Learning outcomes:**

  Students should demonstrate their ability to:

  1. To elaborate the fundamentals of C programming concets
  2. Analyse and Solve computation mathematics problems
  3. Elaborate control structure, array and pointer concepts in C
  4. Learn the architecture of 8 bit microcontroller and Embedded C programming Platforms
  5. Develop embedded C programs with 8 bit microcontroller for Embedded System Design

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  6. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, The 8051 Microcontroller and Embedded Systems Using Assembly and C, Pearson (2007)

DEP203: Project Work

Every student should take up a project & submit in the report the work he/she has carried out. The project work will be assessed independently at the time of practical examination

Mr. J. A. Wagh
Chairman
B.O.S. (Electronics)